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SATN®

Software Arts Technical Notes from the creators of VisiCalc®

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Getting a Line on Curves

"If I spend one more dollar on advertising, what will it produce in increased volume?" has been asked in one form or another by every businessman. But the relation between two measurements is not only a business problem. Population biologists measure population densities and want to know what the population's growth curve looks like. Research physicians test the efficacy of varying dosages of a new drug to treat diseases. Business, science, and education are full of similar sets of test results. The questions most commonly asked about the results are whether there is any relation between one variable and another and what the test can tell about changes in the variables.

In this article we will look at one way of analyzing such results using a common statistical tool, linear regression. We'll also look at ways to find whether a test shows that the results best fit a straight line or one of three curved lines.

The relation between advertising and product demand provides a good basis for an example. And since one of the most precisely testable forms of advertising is direct mail, we'll hypothesize a direct mail campaign for, say, low cost digital watches.

Imagine you are the marketing manager of the company producing the watches. You want to know what happens to the response rate to a direct mail package for each twenty-five-cent increase in the price of the watch. To keep the test reasonably easy to interpret, you decide to use a sample of 75,000 names from a very large list of credit card holders. Each "test panel" consists of 5,000 credit card holders. Each panel receives a direct mail package that is in all but one respect identical to each other package. The one difference is the price at which the watch is sold. The lowest price offered is $9.97, the highest is $13.47. Your final goal is to determine the price at which you'll make the most money on a direct mail campaign. The most important questions to answer, though, and the only ones we'll look at in this article, are how you may interpret the results of the campaign and how you may project a result for a price that is not included in the test.

Are the Numbers Related?

One of the first things you want to know is whether the test has given you any information that is useful. You suspect there is a relation between the offer price and how well your ad pulls, but before you can judge results you must know how reliably related the variables are. To learn that, you must calculate the *correlation coefficient*, a numerical index that ranges from −1 to 1 and expresses the strength of the relation between two variables.

If the correlation coefficient approaches 1, the variables are likely to be positively related. As one rises (or falls) the other will probably rise (or fall). If the correlation coefficient approaches −1, the variables may be negatively related. If one rises, the other will probably fall (which describes what you suspect will happen in your direct mail test). If the coefficient approaches 0, then it's likely the variables are not related in any way that your test has shown. The correlation coefficient is customarily called *R*, which is how we will refer to it hereafter.

To begin, set recalculation to manual and the order of recalculation to row with the entries:

How to Use SATN

The VisiCalc program is available on many different personal computers. These machines may have slightly different keyboards. To reduce confusion, SATN will use the symbol ® and the word RETURN synonymously to represent the keys known as ENTER, ENDLINE, and RETURN. The symbol ^ is used to represent the exponentiation operator.

To make VisiCalc documentation more readable, the program was designed so that the colon (:) has the same effect as RETURN in some commands, as when ending the > command and to separate the various elements of the replicate command.

In examples of what to type, type exactly what you see and press RETURN at the end of every line. On some computers, you may find it necessary to add parentheses to some of the expressions included in the text. For example, 3 + 4*5 may become (3 + 4)*5.

Throughout SATN, one typeface represents both VisiCalc input and output (what you should type and what you will see on the screen). The typeface looks like this:

```
This line is typeset in OCR-B.
So is this: +A1+B1*3.25
```

Characters you should type in are printed in rust.

To allow you to type the formulas directly into VisiCalc, the examples use specific coordinates, like A1, rather than the names of the value they represent. When actually typing a formula, you can use the arrows to point rather than using the > command.

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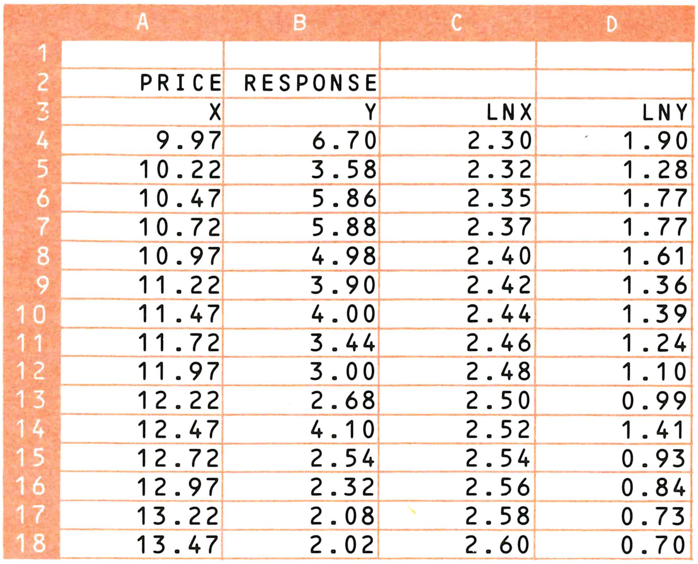


	A	B	C	D
1				
2	PRICE	RESPONSE		
3	X	Y	LNX	LNY
4	9.97	6.70	2.30	1.90
5	10.22	3.58	2.32	1.28
6	10.47	5.86	2.35	1.77
7	10.72	5.88	2.37	1.77
8	10.97	4.98	2.40	1.61
9	11.22	3.90	2.42	1.36
10	11.47	4.00	2.44	1.39
11	11.72	3.44	2.46	1.24
12	11.97	3.00	2.48	1.10
13	12.22	2.68	2.50	0.99
14	12.47	4.10	2.52	1.41
15	12.72	2.54	2.54	0.93
16	12.97	2.32	2.56	0.84
17	13.22	2.08	2.58	0.73
18	13.47	2.02	2.60	0.70

Figure 1. *The sheet has been formatted globally with /F$. Although the entries shown here and described in the text end at row 18, many of the expressions below encompass rows 4...28, allowing you to expand the model to 25 data points without inserting any new rows.*

```
/GRM
/GOR
```

Next, set up the sheet with the labels shown in Figure 1. Then, under PRICE enter:

```
>A4:9.97
```

To produce the rest of the column, replicate the $.25 price increase for each test panel with the entry:

```
>A5:.25+A4®/R:A6...A18:R
```

Now enter the results of the test as the values shown in Figure 1, cells B4...B18. Those values are the percentage response rates that the test panels produced and should be entered exactly as shown in the figure.

Since the basic equations for the curves you have to examine involve exponential calculations and the use of natural logarithms, we will be using the VisiCalc® program's built-in functions @LN and @EXP to manipulate the test values.

The general technique you will use to analyze the data from the test mailing is called *least squares fitting*. It's a form of regression analysis that entails identifying the line that can be drawn through the data points so that the sum of the squares of the distances from the line to any data point is minimized. Besides fitting the least squares line to a straight line, you will fit it to three curves. Figure 2 shows the curves you will test against and the general equations you will deal with. The caption to Figure 2 briefly discusses the relation of a straight line to a curve.

By using the natural logs (@LN) of the test results, you can fit the test results more closely to a straight regression line. But by applying natural logs, the actual values are made smaller. To make any predictions, the values will have to be restored to their original magnitude, which is why @EXP, the inverse of @LN, is used. For now, enter and replicate:

```
>C4:@LN(A4)®/R:D4:R
>C4:/R...D4:C5...C18:RR
```

If you are a VisiCalc Advanced Version user you will notice that many of the replications included in this article can be executed with the () option of the Replicate command. For simplicity's sake, we are not specifying command differences as long as the same command will work in both the Advanced Version and others. If an expression can only be used with the Advanced Version of the program it will precede expressions that work in all versions and be identified with **AVO**, for Advanced Version Only.

If you are using the Advanced Version of the VisiCalc program, your sheet will not require any more columns, since @DOTPROD can be used to develop all the variations that you will need on the first four columns. Skip to the paragraph that begins "The general formula for calculating...".

If you are not using the Advanced Version, you will have to add several more columns to the sheet. First enter the labels that are shown in Figure 3. Then, to create the necessary columns, enter and replicate the following expressions:

```
>E4:+A4*A4®/R:F4...H4:RR
>I4:+A4*B4
>J4:+C4*D4
>K4:+C4*B4
>L4:+D4*A4
```

Those entries create the first line of the data section of your sheet. To fill it out, return to E4 and replicate the last series into rows 5...18. Enter:

```
>E4:/R...L4:E5...
   E18:RRRRRRRRRRRRRRRR
```

The general formula for calculating R, the correlation coefficient is:

$$\frac{N*\Sigma(XY)-(\Sigma X*\Sigma Y)}{SQRT(N*\Sigma(X^\wedge 2)-(\Sigma(X))^\wedge 2*N*\Sigma(Y^\wedge 2)-(\Sigma(Y))^\wedge 2)}$$

The symbol Σ, or sigma, stands for SUM.

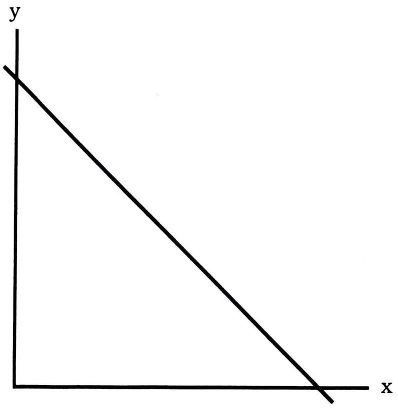
Clearly you will have to enter a number of @SUMs to do that calculation.

After entering the labels that identify the curves you will be testing (shown in Figure 4, rows 30 and 31 in columns B...E) and the various parts of the general equations (shown in column A, cells A33...A39), calculate N, the number of data points, with the entry:

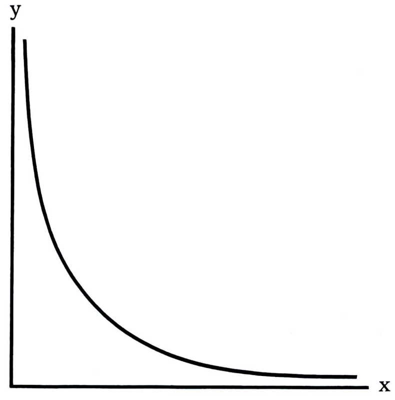
```
>B33:@COUNT(A4...A28)®
      /R:C33...E33:NN
```

Calculating ΣX (referring to the offering price) and ΣY (referring to the response rate) is simply a matter of taking the sums of the columns entered above. Enter:

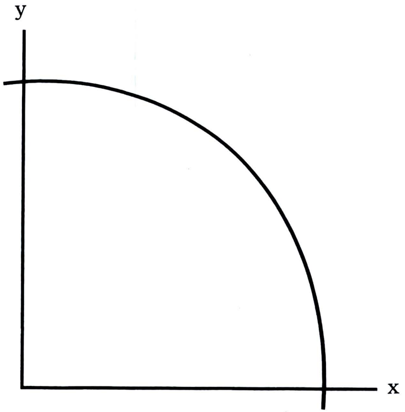
```
>B34:@SUM(A4...A28)
>C34:@SUM(C4...C28)
>D34:@SUM(C4...C28)
>E34:@SUM(A4...A28)
```



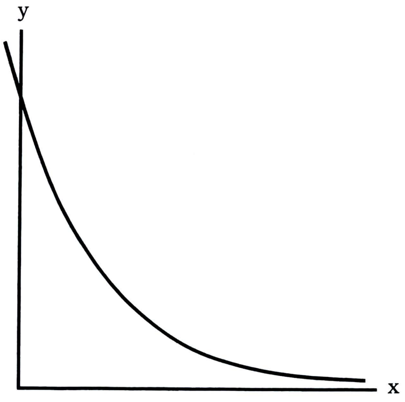
Straight Line $y = bx + a$



Logarithmic Curve $y = a + b * \ln(x)$

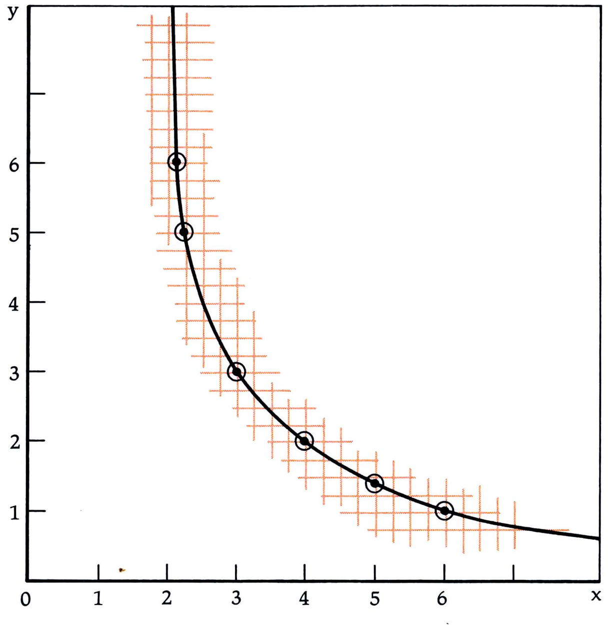


Power Curve $y = a * x^b$

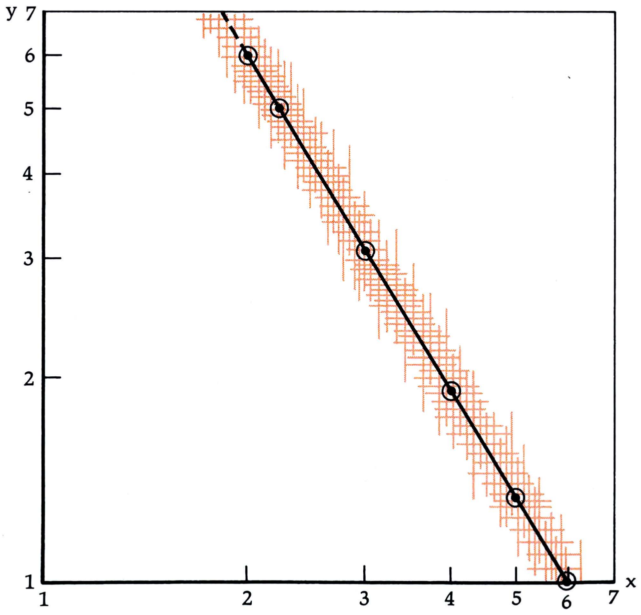


Exponential Curve $y = a * e^{bx}$

Panel A



Linear



Logarithmic

Panel B

Figure 2. The data you plot will show if a predictable relationship exists. If the scattered points appear to fall into an approximately smooth curve—straight lines included—there is a strong possibility the curve will continue, at least for a short distance. And now you can extract previously unknown values.

The four curves in Panel A, which describe common recurring events, are the straight line, the power curve, the logarithmic curve, and the exponential curve. Note that each curve has a corresponding equation and reflects specific types of naturally occurring events. For example, logarithmic curves reveal growth phenomena such as compound interest. Knowing how curves and phenomena match up will point you toward the curve that fits best.

Simple, relatively less complex relationships are uncovered by straight-line graphs. Examples include distance traveled over time (assuming an average speed) and how far a spring stretches with a weight.

Straight-line graphs have a linear equation—no exponents—and are written as $y = bx + a$. The slope, b, is the steepness of the line up or down and can be found on the graph by counting over one square in the x-direction and then up or down in the y-direction. The y distance is the slope. Up is a positive slope and down is a negative slope. The intercept, a, is where the line crosses the y-axis, in other words, when $x = 0$. Some curves never cross the y-axis because x never equals 0.

All curves have slopes. With a straight line the slope is the same for every point, but with smooth curves the slope is always changing. In fact, a slope is a very powerful idea because it describes how the curve changes at any point along the curve. A line drawn tangent to the curve represents the slope at that point. At some points, the slope will be very steep, but as the line flattens, the slope will be less steep. For example, a graph of the radioactive decay of an element would be an exponential curve with a negative slope. Compound interest is a similar curve but with a positive slope. The slope moves up and becomes steeper with more time. In other words, the longer money is left in an account, the faster the total dollars will grow. In calculus terminology the slope or rate of change is a first derivative.

The two sample curves in Panel B show the same values plotted on conventional graph paper and log paper. Why? Don't logs just add an unnecessary step? Logs were first used to simplify calculations: multiplication and division become addition and subtraction. Second, over time the log curves have gained a useful familiarity when curve fitting and the points straighten to a line when plotted on log graph paper. Remember, lines are easier to study.

But the real power in using natural logs is that calculations are simpler. Because of a unique property, one calculation is eliminated. The slope for any x,y point on a natural log curve is the same as the y value. For example, at $x = 6$, $y = 10$ the slope of the line is 10. So $y = e\^x$ and so does $y' = e\^x$. So the derivatives need not be calculated. All other curves require separate calculations.

Notice that you have actually just entered @SUMS for X and the natural log of X, which was calculated in column C. Though we shall be using natural logs of X and Y often through the next few paragraphs, for simplicity's sake when we refer to X and Y, we shall mean both the variables and their natural logs.

The entries for the response rate, Y, are:

```
>B35:@SUM(B4...B28)
>C35:@SUM(D4...D28)
>B35:/R...C35:D35:NNNN
```

(If you are using the Advanced Version of the program, skip ahead a few paragraphs to the one that begins "The @DOTPRODuct function of....)"

To generate XY and the various versions of XY required by the different curves, enter and replicate:

```
>B36:@SUM(I4...I28)®/R:C36...E36:RR
```

For X^2, enter and replicate:

```
>B37:@SUM(E4...E28)®/R:E37:NN
>C37:@SUM(G4...G28)®/R:D37:NN
```

For Y^2, enter and replicate:

```
>B38:@SUM(F4...F28)
>C38:@SUM(H4...H28)
>B38:/R...C38:D38:NNNN
```

The following paragraphs concern the use of @DOTPROD. If you are not using the Advanced Version of the program, skip ahead a few paragraphs to the one beginning "Now, whether you are using...".

The @DOTPRODuct function of the Advanced Version of the program allows you to eliminate most of the columns shown in Figure 3. The function requires that you specify two ranges of equal length. If they are not of equal length or they are not ranges (coordinates separated by "..."), the function will return ERROR. The function takes each element of the first range and multiplies it by the corresponding element in the other range and returns the sum of those products. It's worth mentioning here that the ranges in @DOTPROD can be written in either direction. That is, you can write @DOTPROD(A1...A5,B5...B1), and the program will multiply A1 by B5, A2 by B4, and so on, and return the sum of that series.

To enter XY and the various versions of XY required by the different curves, enter:

```
AVO >B36:@DOTPROD(A4...A28,B4...B28)
AVO >C36:@DOTPROD(C4...C28,D4...D28)
AVO >D36:@DOTPROD(C4...C28,B4...B28)
AVO >E36:@DOTPROD(A4...A28,D4...D28)
```

For X^2, enter and replicate:

```
AVO >B37:@DOTPROD(A4...A28,A4...A28)
AVO >C37:@DOTPROD(C4...C28,C4...C28)
AVO >B37:/R(N):E37
AVO >C37:/R(N):D37
```

For Y^2, enter and replicate:

```
AVO >B38:@DOTPROD(B4...B28,B4...B28)
AVO >C38:@DOTPROD(D4...D28,D4...D28)
AVO >B38:/R(N)...C38:D38
```

Now, whether you are using the Advanced Version of the program or an earlier one, you can calculate R, the correlation coefficient, for the four curves. Enter:

```
>B39:/FG+B33*B36-(B34*B35)/
     @SQRT((B33*B37-(B34*B34))*
     (B33*B38-(B35*B35)))
```

Now replicate it into columns C...E. Enter:

```
>B39:/R:C39...E39:RRRRRRRRRRRR
```

That calculation shows that the price and the response rate appear to be negatively related; as the price rose, the response fell.

As you can see, the data points best fit the exponential curve. Though the most reasonable thing for you to do now would be to concentrate on that curve, the calculations of the various curves differ, so we will continue to show how they are all calculated.

Once you know that your data best fit one curve or another, you can ask the question: "What if I tried a price that isn't on the test?" For example, look at the response for $12.47. It's higher than the response for $11.47. Is it likely that if you were to set $12.59 as the price for the follow-up mailing that you could expect a response near the one that tested at $12.47? It's more likely that you'd be disappointed. The question is, at $12.59, what can you really expect?

Calculating the Slope and Intercept

Given only two points, a straight line is the only reasonable, though not necessarily most accurate, way to connect them. But what if you have 15 or 20 scattered points? It may be easy, simply by eyeballing the numbers, to see whether the points indicate a rising or declining trend.

But do the data points describe a perfectly straight line? Or a curve that is flattening? Or declining ever more steeply? And more important, if you want to project the trend, where should you place the projected point?

To take the model to the next step, you have to calculate the slopes of the various curves you are dealing with and the points at which the curves would intercept each curve's X-axis.

By using the various combinations of the natural logs of the data points and the data points themselves, we in effect calculated the equivalents of "straightened" curves, as shown in Figure 2. The general formula for finding the slope of a line is:

$$SLOPE = \frac{N*\Sigma XY-(\Sigma X*\Sigma Y)}{N*\Sigma X\char`^2-(\Sigma X)\char`^2}$$

Since all the values for the elements of that equation are on the sheet, all that you must do is enter:

```
>B40:+B33*B36-(B34*B35)/
     (B33*B37-(B34*B34))
```

Which is replicated into columns C...E with the entry:

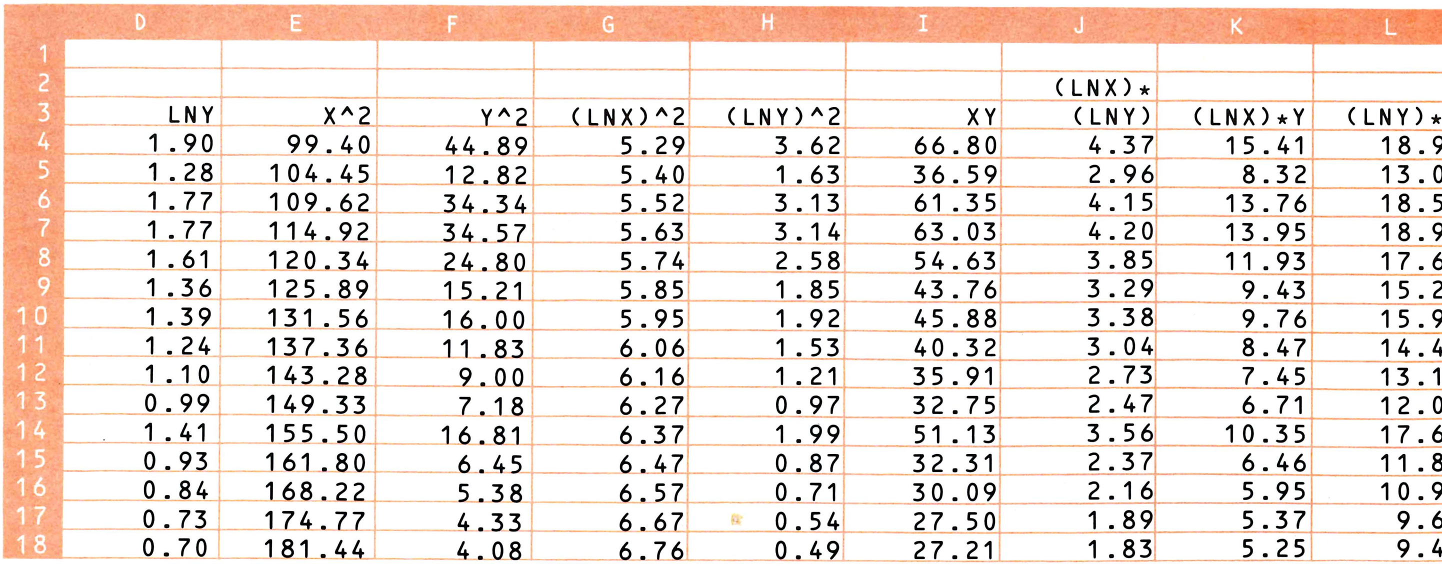
```
>B40:/R:C40...E40:RRRRRRRR
```

Given a slope, the intercept is calculated with the general formula:

$$INTERCEPT = \frac{\Sigma Y-(SLOPE*\Sigma X)}{N}$$

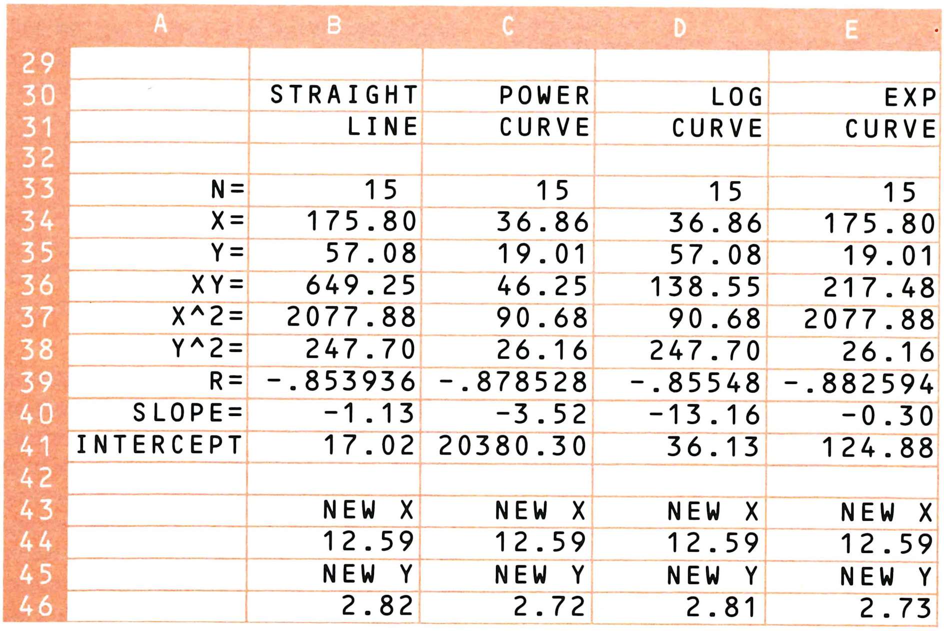
Which is entered and replicated on your sheet as:

```
>B41:+B35-(B40*B34)/B33
```



	D	E	F	G	H	I	J	K	L
1									
2							(LNX)*		
3	LNY	X^2	Y^2	(LNX)^2	(LNY)^2	XY	(LNY)	(LNX)*Y	(LNY)*
4	1.90	99.40	44.89	5.29	3.62	66.80	4.37	15.41	18.9
5	1.28	104.45	12.82	5.40	1.63	36.59	2.96	8.32	13.0
6	1.77	109.62	34.34	5.52	3.13	61.35	4.15	13.76	18.5
7	1.77	114.92	34.57	5.63	3.14	63.03	4.20	13.95	18.9
8	1.61	120.34	24.80	5.74	2.58	54.63	3.85	11.93	17.6
9	1.36	125.89	15.21	5.85	1.85	43.76	3.29	9.43	15.2
10	1.39	131.56	16.00	5.95	1.92	45.88	3.38	9.76	15.9
11	1.24	137.36	11.83	6.06	1.53	40.32	3.04	8.47	14.4
12	1.10	143.28	9.00	6.16	1.21	35.91	2.73	7.45	13.1
13	0.99	149.33	7.18	6.27	0.97	32.75	2.47	6.71	12.0
14	1.41	155.50	16.81	6.37	1.99	51.13	3.56	10.35	17.6
15	0.93	161.80	6.45	6.47	0.87	32.31	2.37	6.46	11.8
16	0.84	168.22	5.38	6.57	0.71	30.09	2.16	5.95	10.9
17	0.73	174.77	4.33	6.67	0.54	27.50	1.89	5.37	9.6
18	0.70	181.44	4.08	6.76	0.49	27.21	1.83	5.25	9.4

Figure 3. *For readers without the @DOTPRODuct function a larger number of columns are required to calculate R and to project a new value for X. Once you have created the necessary columns, you can save a DIF file (/S#S) that begins at A4 and ends at L18, or whichever cell you wish to define as the lower right of the file. Then, after saving the file a second time as an ordinary VisiCalc file (/SS), you can overlay the DIF file on the file containing the calculations. That will replace the expressions with their calculated values and thereby reduce recalculation time. Remember that when you load a DIF file over any other VisiCalc file, blank cells in the DIF file write over any nonblank cells on the sheet. When you load an ordinary VisiCalc file atop another, blank cells do not write over other cells.*



	A	B	C	D	E
29					
30		STRAIGHT	POWER	LOG	EXP
31		LINE	CURVE	CURVE	CURVE
32					
33	N=	15	15	15	15
34	X=	175.80	36.86	36.86	175.80
35	Y=	57.08	19.01	57.08	19.01
36	XY=	649.25	46.25	138.55	217.48
37	X^2=	2077.88	90.68	90.68	2077.88
38	Y^2=	247.70	26.16	247.70	26.16
39	R=	-.853936	-.878528	-.85548	-.882594
40	SLOPE=	-1.13	-3.52	-13.16	-0.30
41	INTERCEPT	17.02	20380.30	36.13	124.88
42					
43		NEW X	NEW X	NEW X	NEW X
44		12.59	12.59	12.59	12.59
45		NEW Y	NEW Y	NEW Y	NEW Y
46		2.82	2.72	2.81	2.73

Figure 4. *Notice that the values for R and N are formatted to /FG and /FI respectively. We have formatted R so that we can show the full differences between the values. Had we not specifically formatted them, the POWER CURVE and the EXP CURVE would have appeared to have the same R. The values for N, of course, will always be integers, so we formatted them that way.*

To account for the use of natural logs, the intercept for the power curve is calculated with the entry:

```
>C41:@EXP(C35-(C40*C34)/C33)
```

The intercepts for both the log and the exponential curves are calculated in the same ways, respectively, as the straight line and the power curve. Thus, replicate:

```
>B41:/R...C41:D41:RRRRRRRR
```

Now, to calculate the value for a price that was not included in the test, enter the untested price. Since the test at $12.47 produced so anomalous a result, look at a price very close to it. Enter and replicate:

```
>B44:12.59
>C44:+B44®/R:D44...E44:RR
```

In general terms, the expression for finding the projected value of the new price, Y, is:

New Y = (Slope ∗ New X) + Intercept

The expressions to calculate the new value of Y, given a new X, are entered on row 46. The expressions differ from each other a great deal although each follows the same general rule. The differences are in the use of @EXP and @LN.

```
>B46:+B40*B44+B41
>C46:@EXP(C40*@LN(C44)+@LN(C41))
>D46:+D40*@LN(D44)+D41
>E46:@EXP(E40*E44+@LN(E41))
```

Looking at the results of those calculations, shown on row 46 in Figure 4, it seems likely that if you had believed that your ad campaign would produce around 4.1% response at $12.59, you'd have made a serious mistake. It's more likely to produce around 2.73%. If you rolled out a mailing to 1,000,000 credit card holders, the difference would amount to more than 13,000 orders for watches.

It's interesting to compare the expected responses. Given the data used, the most likely fit produced neither the highest nor the lowest new Y. At $12.59, there's not a very large difference between the new Ys. If you raise the new X to 13.59, the differences are much more pronounced, as it is if you lower the new X substantially.

In closing, there are a few things to point out about the model you have developed. For one, the large number of calculations using @LN significantly affect the recalculation speed of the model. One way around that is to turn the entries in rows 4...28 into a DIF file and then reload that file. That way all the calculations will be turned into values. Once that's accomplished, you can also turn the calculations of R, the slope, and the intercept into a DIF file as well, since none of them will change unless the underlying test results change. In either event, save the file as an ordinary /SL file first, so that you can reuse it with new data.

Note that when you change data you must blank out any cells that take the natural logs of empty cells. There is no natural log of 0, and the VisiCalc program returns @ERROR when asked to calculate @LN of a blank cell, which it reads as 0.

One final point: We opened with a question. Now it's easy to answer. Make your past advertising budgets equal to X, the sales results equal to Y, and call your agency.

A Look at Accelerator II

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Accelerator II

$599.00

Titan Technologies, Inc.
3990 Varsity Drive
Ann Arbor, MI 48104

by Barry Bayer

My original copy of the VisiCalc® program for the Apple][was slow to boot but, once running, operated without noticeable delay. Of course, template work space was limited to about 25K, the Apple 40-column display limited a line to 37 visible characters, Boolean and DIF functions were not part of the program, and I had not yet learned to use such time consuming functions and operators as @LOG10 and ^.

I am still using the same Apple][, but other things have changed a bit. Version 137 has given way to Version 202; I've added a 128K RAM card, 80-column card, and an expansion preboot to permit files as large as 136K to be displayed with an 80-column display. That's all had its drawbacks. No longer can I hit ® and get almost instant gratification as all the numbers change. Even the /C command can take 5 or 10 seconds to execute. Those add-ons make the VisiCalc program more powerful, but they also slow things down to a degree I find irritating.

Enter the Accelerator II by Titan Technologies, Inc. The package consists of a board, loaded with integrated circuits, and a disk with system software. The board contains a "fast" 6502 microprocessor and associated integrated circuits, and 64K of "fast" RAM. To install the board you only have to turn off the computer, insert the board into one of the Apple slots, and check the settings of one DIP switch on the board. In five minutes you should be able to do that a few times.

The Accelerator II takes over most of the functions on the Apple motherboard, and runs at 3.6 Megahertz (MHz), rather than 1 MHz as in the standard Apple][. It also speeds up most Apple functions by a factor of 3 or more. Reading from and writing to the disk remain at the standard speed, but processing times between disk reads is faster. A preboot is required with some programs, but once the system is running, the Accelerator II is transparent to the user. The Accelerator II manual says the preboot is not required for VisiCalc, but my computer seems to need it. On the other hand, my expansion preboot does not require an Accelerator preboot to work. It seems to depend to some degree on the mix of cards you've already added to your Apple.

The Accelerator II disk includes programs to modify Apple Pascal to be used with Accelerator II and to turn it off so that you can use CP/M disks. (A fast 6502 won't help the Z-80 processor on the CP/M card to work any faster.) Many standard DOS programs can be used without modification.

Once the VisiCalc program is running, the Accelerator II works well, and, as advertised, everything except disk reading and writing is recognizably faster—even the error "beep," which becomes a short, high-pitched signal. Since the "beep" is created by toggling the Apple speaker, this is direct evidence that the Accelerator II is working. Experienced Apple users know that the addition of an 80-column card slows scrolling to a very noticeable degree. I suppose some people learn to live with it after a while, but I find it annoying. An unexpected advantage of the Accelerator II was to make 80-column scrolling almost tolerable.

To quantify my impressions about the Accelerator II, I replicated the numbers 1 through 79 into cells A1 through A79.

```
>A1:1
>A2:1+A1
>A2:/R:A3...A79:R
```

I then entered the formula 2*3^A1 into cell B1, and replicated that down to B79.

```
>B1:2*3^A1
>B1:/R:B2...B79:R
```

The times taken for recalculating this meaningless but time-consuming template, with and without the expansion preboot, and with and without the Accelerator II, are shown in Table 1. Although the results are impressive, at $600 the Accelerator II is costly for an individual to buy. Still, $600 is cheaper than buying a new computer and a new version of VisiCalc.

Except for the price, I would definitely recommend the Accelerator II as a useful tool for Apple VisiCalc users, particularly those who use large memory expansion boards and 80-column cards. If money is not a limiting consideration, get one.

	With Accelerator II (seconds)	Without Accelerator II (seconds)	% Increase Without Accelerator II ÷ With Accelerator II
Unexpanded VisiCalc			
Clear (/C)	*	.84	N/A
2*3^A1	14.19	48.21	339.75%
With Expansion Preboot			
Clear (/C)	2.79	8.57	307.17%
2*3^A1	14.79	50.22	339.55%

*Too fast to measure.

TABLE 1.

Book Review

Reviews published in SATN are the opinions of the reviewers, not of Software Arts, and may not be construed as official positions or endorsements by Software Arts.

Advanced Uses of VisiCalc for the IBM Personal Computer

by Edouard J. Desautels. Wm. C. Brown Company Publishers, Dubuque, Iowa, 166 pp., $16.95 ($56.90 including optional diskette).

Reviewed by Robert Hildebrand

Picking up where he left off in his earlier work, *VisiCalc for the IBM Personal Computer* (reviewed in the March/April 1983 issue of SATN®), Desautels wrote this book for experienced users who have run up against some of the VisiCalc program's limitations and want to get more out of the program. Desautels' main solution was to write programs in BASIC that address limitations in such areas as printing and sorting data. While new features in VisiCalc Advanced Version have rendered many of these programs unnecessary, the book remains valuable because it provides an excellent discussion of the structure of the VisiCalc program and the kinds of files it creates.

There is an optional diskette that can be ordered separately from the publisher containing the VisiCalc worksheets and BASIC programs used. I strongly advise you to get it. Otherwise you would need to type, according to Desautels, about 46,000 characters to get all the material on a diskette.

Creating A Worksheet

The first two chapters are about building VisiCalc worksheets. There are only two significant VisiCalc models shown in the book; most of the book is concerned with using BASIC and other tools with models already developed. Because this book deals with the limits of the VisiCalc program, it assumes competence in using the program.

The first sheet developed analyzes the option of renting or buying property. While of interest in itself, it is included primarily to give an overview of the VisiCalc program and an environment in which to discuss building a sheet.

Desautels' primary philosophy in putting together a sheet is this: Plan ahead. Try as much as possible to be aware of your model's direction so you can allow for expansion and modification. Furthermore, in choosing formulas, keep in mind their potential for replication. Keep them as general as possible.

He divides the template into modules and creates each module separately. He inserts blank rows and columns into the modules, moving them to their final positions, then saves them individually. Finally, he overlays all the modules onto the same sheet, creating the finished model. It is a nice exercise in building a rather complex sheet.

Overcoming Some of the VisiCalc Program's Limitations

The limitations of the VisiCalc program that Desautels tackles with BASIC mostly deal with printing sheets, sorting values, and viewing/printing formulas.

You can probably learn all the BASIC necessary to understand what Desautels does and to be able to write your own simple programs in a couple of hours. Desautels provides a nice, short introduction to BASIC and does a good job explaining new features as he uses them.

The first program allows you to display any VisiCalc file (saved by /SS, /S#S, or /PF) to the screen or to the printer. This in itself does not add much over the IBM DOS command "TYPE" but it is a good entry into the structure of a BASIC program and how BASIC handles printing and accessing files on a diskette for processing.

Another program processes a print file (one created by /PF) and, following your specifications, prints it out with variable column widths, instead of the fixed column widths you normally get. (VisiCalc Advanced Version has this facility built-in.) It's a nice solution but limited: In each column all entries must be either flush left or flush right or you could lose some characters when you run the program. Nonetheless the program is an easy fix if you want your printout to look more natural instead of being constrained by one width for all columns.

There is a good discussion on using printer setup strings, something that many users have trouble with. One program processes a file saved with /PF and prints it out, using setup strings, with a title in expanded type, a subtitle, and even allows for footnotes.

Chapter 6 is all about sorting data. One program takes a VisiCalc print file and sorts it by row, allowing you to specify which column you want used as the key. It is useful, for example, when you want to print out an alphabetical list of names and related data.

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Newton, MA 02162

Manipulating DIF files

The programs mentioned above process print files, so the manipulated data cannot be returned to a worksheet. There is a way, of course, to take data out of a VisiCalc sheet, play with it, and return it to the sheet—with DIF™.

Several programs are included that create or modify DIF files. One takes values stored in a BASIC program and creates a DIF file for inclusion into a VisiCalc sheet or into any other DIF-compatible program. Another takes a DIF file and puts it into a format that BASIC reads.

There is a program called DIFTODIF that sorts data. Say you want to sort, alphabetically or numerically, a particular part of the sheet and continue to use it. You can save that section as a DIF file, process it through DIFTODIF, which creates a sorted DIF file, then overlay that file back into your sheet. The program is extremely easy to use and very helpful. Of course, because it uses a DIF file, the expressions are not saved.

With a little knowledge of BASIC, it is easy to modify the programs. I found it necessary to modify several because they had been written such that each time they were run, the new file, such as the sorted DIF file, overwrote the file created when the program was run previously. I modified them to allow me to specify a new filename each time the programs are run. It didn't take much work.

Several other intriguing topics are covered as well, such as ways to store often-used sequences of commands both at DOS level and at the VisiCalc level so you don't have to type them each time you need them; viewing formulas on a VisiCalc sheet; consolidating worksheets; and integrating the VisiCalc program with word processing, much as we've been presenting in SATN in the series by Craig Stinson.

A lot of the things accomplished in this book are rendered unnecessary by new features in VisiCalc Advanced Version. But even if you have that version of the VisiCalc program, the book is valuable because it contains excellent discussions about the kinds of files that you are working with (storage files, print files, and DIF files), how they differ, and how they can be manipulated. After you have gone through this book you will have a far better idea of what the VisiCalc program is all about.

Also, there may be specialized features that you may want that have not been incorporated into Advanced Version; with knowledge gleaned from *Advanced Uses of VisiCalc for the IBM Personal Computer*, you may get an idea how to implement them.

Robert Hildebrand is a staff writer for SATN Publications.

Related Products Checklist

The information contained in this column has been garnered from a variety of sources including dealers, press releases, manufacturers, and advertising.

No one at Software Arts has reviewed or examined any of these products to determine whether they perform as claimed or as listed below. An inclusion in this listing does not constitute an endorsement by Software Arts of that product. We also wish to point out that if any of the products listed alter, patch, or copy the VisiCalc® program, they could be in violation of your user licensing agreement and/or the copyright.

Since we have not reviewed any of the products, we cannot provide you with any more information than is contained in the list. If you want to learn more or you wish to purchase any of the products listed, contact your dealer first. Although we have identified distributors in some listings, many distributors do not accept orders from individuals for single copies of software or pieces of hardware.

TRAINING

ATI Training Power for VisiCalc, IBM
- Available for IBM PC users

Training system for VisiCalc users on the IBM. Includes diskette and reference book.

Distributed by ATI, Manhattan Beach, CA.

Suggested retail price: $75.00.

Personal Tutor
- Available for Apple and IBM PC

Each package includes three instructional tapes plus reference card and diskette.

Distributed by Personal Tutor Associates, Clinton, MD.

Suggested retail price: $49.95.

Learning Concept: The VisiCalc Program
- Available for IBM PC

Package contains a video tape in three segments and a Quick Reference Guide. The initial segment familiarizes the user with the IBM Personal Computer and explains preparation of the VisiCalc program and data diskettes. The second segment teaches how to build a simple spreadsheet. The third segment teaches how to modify a simple spreadsheet to exact specifications.

Distributed by Micro Learning Concepts, Inc., New York, NY.

Suggested retail price: $129.95.

How to Use VisiCalc
- Available for any computer that runs VisiCalc

"How to Use VisiCalc" starts with how to set up a spreadsheet with labels, values and formulas and then moves to more advanced concepts such as Replicate, Choose, Lookup, and Net Present Value.

Distributed by FlipTrack Learning Systems, Glen Ellyn, IL.

Suggested retail price: $65.00.

SOFTWARE

Only software that claims to complement the VisiCalc program will be listed.

Graphics

Telicalc II

- For several microcomputers

Color graphics system offering a choice of stacked histograms, clustered bar graphs and multiple line charts. Allows editing of graphs. Graphics files can be downloaded by telephone to hardcopy service bureaus.

Distributed by Norpak Ltd., Toronto, Ontario, Canada.

Suggested retail price: $195.00.

The Draftsman 1.0

- Runs on IBM PC
- Supports DIF format

Menu-driven general graphics program that accepts data input in a variety of formats, including VisiCalc DIF files. Allows direct editing of screen images.

Distributed by Starware, Washington, DC.

Suggested retail price: $200.00.

Word Processors

The Gutenburg

- Runs on Apple II+

A word processing program including file merging, form letter capability, file housekeeping, split screen editing, user-designable characters, graphics, justification, multiple columns and blocks of text, reformatting of output, and chaining of output files.

Distributed by: Micromation Limited, Toronto, Ontario Canada.

Suggested retail price: $315.00.

Templates

MEDICARD

- Runs on Apple /// Computer with at least 128K, Apple][and IBM PC

This template is used for small medical practices to handle private billing and AMA universal claim form preparation. Patient files can be created for individual patients or families. Patient records can be recalled for bill posting or on-screen review of their payment status. Fees which are not billable under insurance plans can be flagged and billed to the patient's private account.

Distributed by CMA Micro Computer, Yucca Valley, CA.

Suggested retail price: $249.95.

Financial Planning for VisiCalc and the Apple][

- Runs on Apple][

This package is made up of a number of data templates with line and row headers and calculations in place.

Distributed by Howard W. Sams & Co., Inc., Indianapolis, IN.

Suggested retail price: $79.95.

Tax Templates

- Runs on Apple][,][+,][e, ///, IBM PC, TRS-80 I, and TRS-II. Minimum memory: 33K

Applicable to personal and business taxes. Use for Forms/Schedules: 1040, A, B, C, E, G, FE, EF, W, Energy Credit, Child's Credit.
Also includes "Your Income Taxes for 1982," by J.K. Lasser.

Distributed by Omega Micro Ware Inc., Chicago, IL.

Suggested retail price: $90.00.

Tax Planning Model

- Runs on IBM PC

Contains four spreadsheet files, each of which contains a format for filling out various 1040 tax forms. This package is referred to as the "personal package." There is also a "professional package" that contains two additional forms for corporate and partnership returns.

Distributed by Pansophics Ltd, Rockport, MA.

Suggested retail price: "personal package" $100, "professional package" $150.

Financial Management Models for the Service Firm Package

- Runs on Apple][+ with 48K, Apple /// with 128K

A series of 11 VisiCalc templates for such fields as engineering, advertising, architecture and consulting. The models help to forecast cash needs, budget projects, estimate fees, and determine billing rates. The models are set up to be adapted to the individual firm's needs. Included is a 175-page manual.

Distributed by PRO/PAC, Inc., Houston, TX.

Suggested retail price: $295.00.

Money Manager

- Runs on Apple][, Apple][E, and IBM PC

Eleven templates dealing with various areas of personal financial planning, portfolio management, and retirement planning. Includes 80-page manual.

Distributed by The American College, Bryn Mawr, PA.

Suggested retail price: $75.00.

VisiCalc Real Estate Templates

- Runs on IBM PC with 64K

Included in the two-disk package are options that generate interactive reports for internal rate of return, ACRS depreciation, declining balance depreciation, amortization system, mortgage loan analysis, personal financial statement and income property investment analysis.

Distributed by Sofstar Inc., Juno Beach, FL.

Suggested retail price: $119.95.

Cash Flow Analysis

- Runs on IBM PC, Apple II+, Apple III and Radio Shack TRS-80 Model III

This template analyzes before and after-tax income projections and net sales proceeds, and incorporates ACRS.

Distributed by Loven-Murphy, Inc., Charlotte, NC.

Other Software

The VC Formula Printer

- Runs on Radio Shack TRS-80 Models I, II, III and 16

Program that reads a VisiCalc application file, organizes it, and either prints it on paper or writes it to a disk in the same column and row grid that VisiCalc uses.

Distributed by The Alternate Source, Lansing, MI.

Suggested retail price: $39.95, ($49.95 for TRS Model II).

MergeCalc

- Runs on Apple II+ and IBM PC

Menu-driven program that merges VisiCalc files.

Distributed by Cypher, San Francisco, CA.

Suggested retail price: $125.00.

VIS/Bridge/REPORT

- Runs on IBM PC, Apple II+, Apple ///, and Radio Shack TRS-80 Models I, II, III, 16

Allows user to create presentation quality reports with any current version of VisiCalc.

Distributed by Solutions, Inc., Montpelier, VT.

Suggested retail price: $79.00.

Vis/Bridge/Sort

- Runs on IBM PC, Radio Shack TRS-80 Models I, II, III, 16, Apple II+ and Apple ///

Sorts rows or columns of a Visicalc spreadsheet. Up to five rows or columns may be used as sort keys. Each key may be alphabetic or numeric and in either ascending or descending order.

Distributed by Solutions, Inc. Montpelier, VT.

Suggested retail price: $89.00.

To submit information on products (software or hardware) that support either the VisiCalc program or the DIF format for data exchange, send us the name of the product; what it does; who developed it; who markets and distributes it; the suggested retail price; if it is software, what machine(s) it runs on and whether it supports the DIF format. Send the information to:

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P.O. Box 99
Newton, MA 02162

In Our Next Issue

We promised last month that this issue would include an article on using the VisiCalc program with ScreenWriter II, a word processing program for the Apple II, and a review of the Nevison *Executive Computing* package. But when Barry Bayer's review of the Accelerator II board came in ahead of schedule, we decided to run it instead. So both the review of the Nevison package and the ScreenWriter II piece will appear in the November/December issue of SATN.

Solving Circular Calculations

Using a model developed by a large Eastern real estate construction and development firm to calculate costs, we'll show techniques for loading circular references and constructing "pseudo loops" to perform iterative calculations.

And Soon to Come . . .

Using @LOOKUP and @CHOOSE . . . what do you do when the number of things to look up is greater than the number of rows or columns in your spreadsheet? What if you have to find a number in an array? If the array is made up of numbers that are not in ascending order?

Using /PF to create files that execute a series of commands when you load it with /SL. How useful is the technique that some call "datagramming"? Which commands work (some do and some don't) depends on the version of the program and the kind of machine you're using. A brief guide to the plusses and minuses of the technique.